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(54) Embroidery machine with clamping device for single embroidery frames

(57) For three-point clamping of a single embroidery frame (55), consisting of an inner frame (52) and a surrounding outer frame 54 with the embroidery workpiece inbetween, the clamping device includes two oppositely disposed supports (56, 58), one of which (56) has two abutment surfaces including an angle for matched support surfaces of the outer frame, and the other has a spring member (57) with a recess 69, 70 for a protrusion (67, 68) on the outer frame, positioned on the bisector of the angle formed by the abutment surfaces.

If the outer frame is transversely slotted and if its ends are linked by a tension lock, then a symmetrical widening of the outer frame, independent of the thickness of the embroidery workpiece, is achieved in that the tension lock is arranged in the symmetrical axis of the abutment surface on the bending spring of the one support and the abutment surface(s) of the oppositely disposed support.

Fig.4

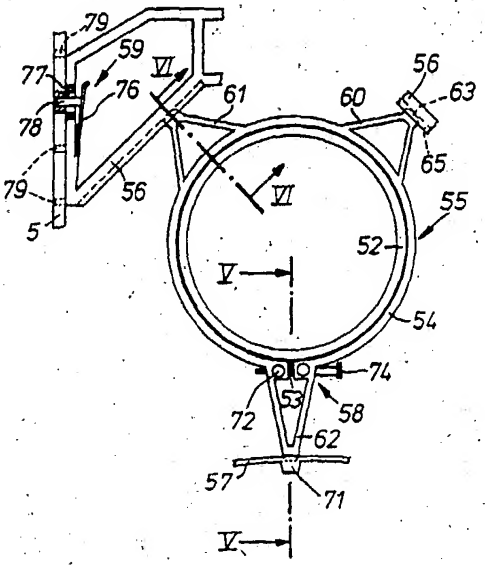

Fig.5

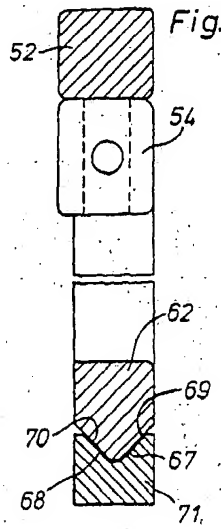

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Fig. 2

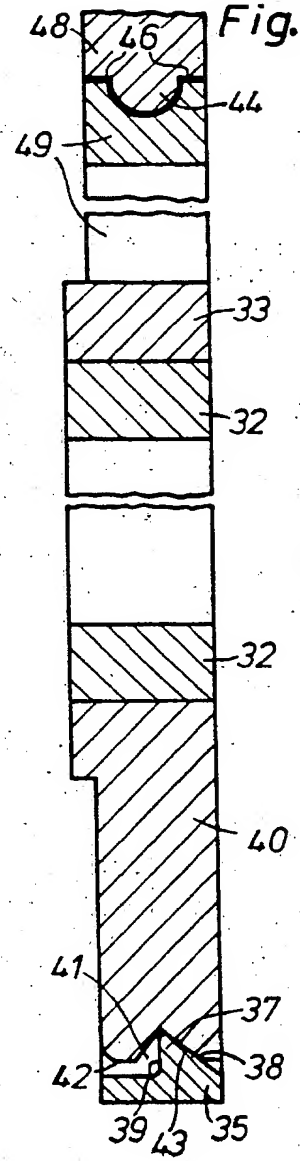


Fig. 1

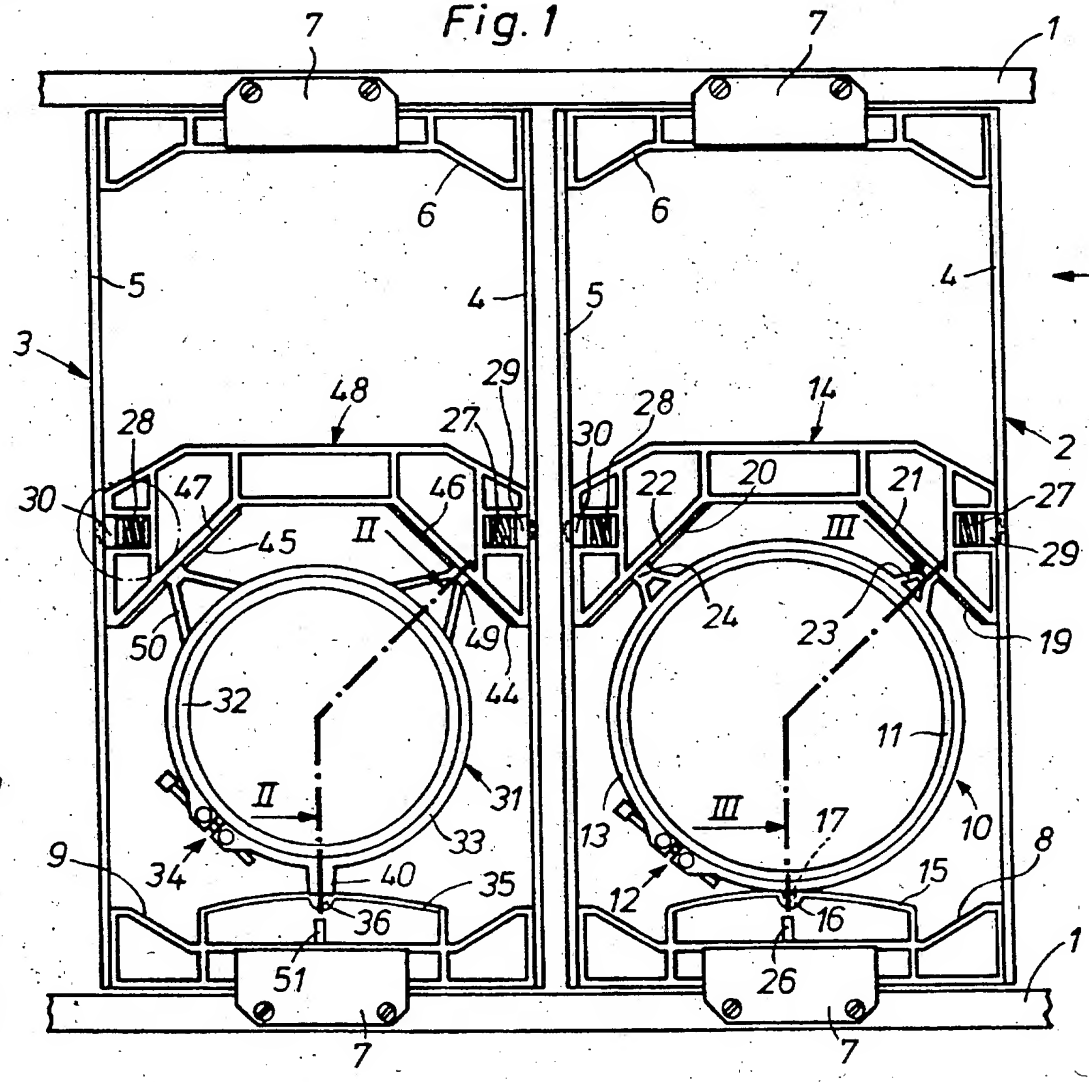
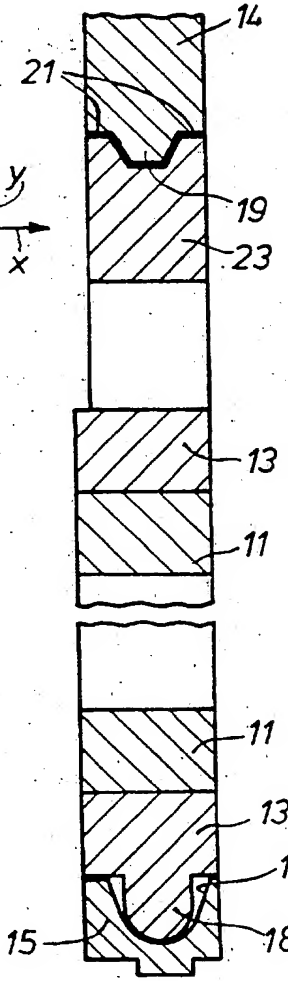


Fig. 3



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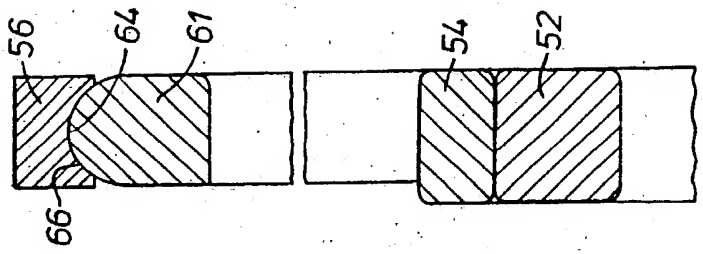

Fig.6

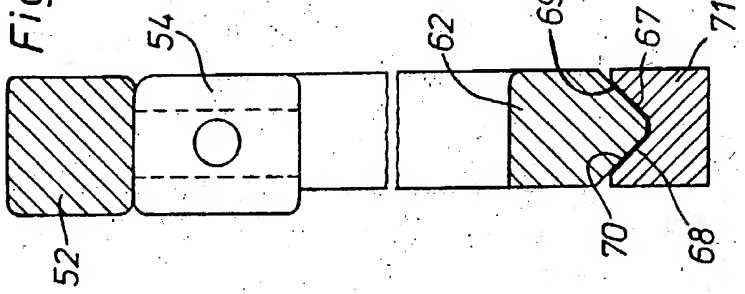

Fig.5

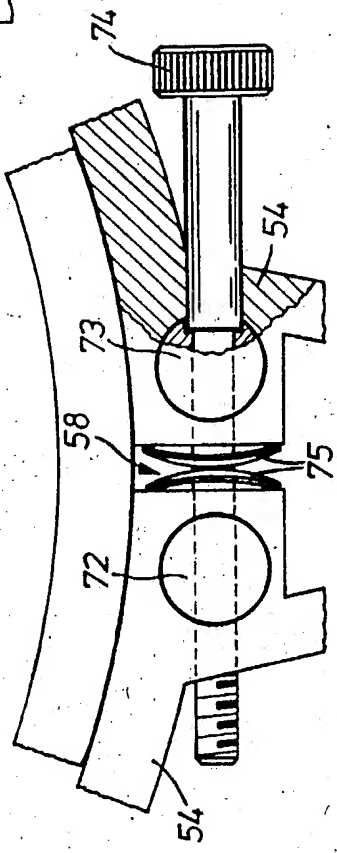

Fig.7

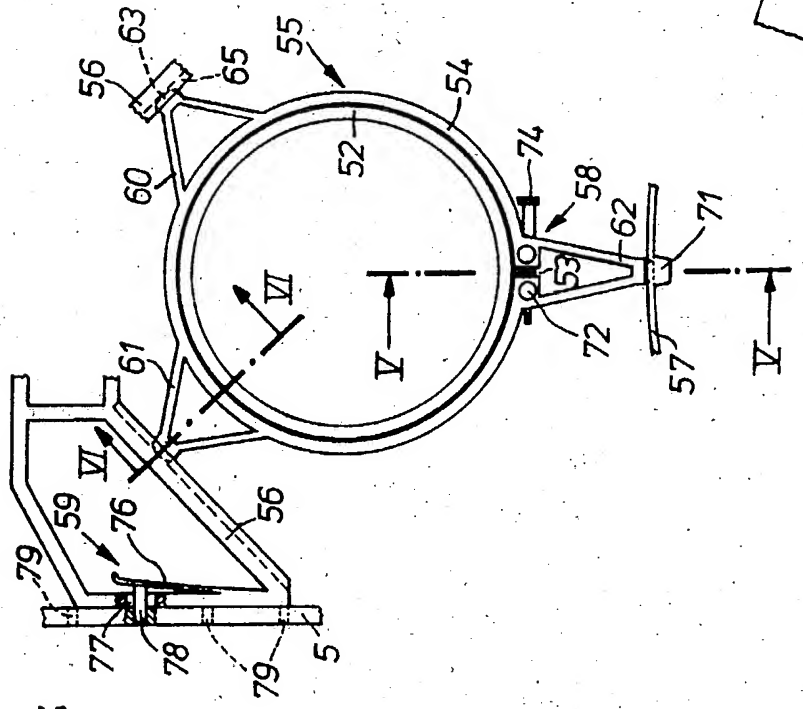

Fig.4

Title: Embroidery machine with clamping device for single embroidery frames.

DESCRIPTION

The present invention relates to an embroidery machine.

From the Japanese GM-AS Sho-62-3424, a clamping device, to be mounted onto the controlled frame guide of an embroidery machine, for a single embroidery frame is known which, for the purpose of three-point tensioning of the individual embroidery frame, consists of a rectangular frame which is connectable with the frame guide, at the front cross shank of which frame is provided a foam-material covered extension, serving as one point of the three-point tensioning. At each side shank of the rectangular frame, there is a pair of levers as carriers of a clamping means with its clamping surface covered by foam material. The clamping means constitute the other points of the three-point tensioning. One lever of each of the two pairs of levers is inserted by means of a bearing pin into a bore in the side shank at the end opposite the clamping member. The other lever of each pair of levers is hinged to the first lever between the pin and the clamping member. A fixing screw, screwed into a nut

inside the side shank, passes through a bore in the other end of the first lever and through a longitudinal slot into the side shanks of the rectangular frame.

The device is intended for clamping of single embroidery frames of different sizes. The clamping of a single embroidery frame is done in that the single embroidery frame is placed against the foam-material cover of the extension at the front cross shank of the rectangular frame, the fixing screws are released, and the two pairs of levers are moved with longitudinal displacement of the fixing screws in the longitudinal slots of the side shanks at a certain pressure against the periphery of the single embroidery frame so that the individual embroidery frame is clamped at three points. The clamping position of the single embroidery frame is then secured by tightening of the fixing screws.

Releasing, tightening and displacing of the fixing screws and the tilting of the pair of levers with each change of embroidery frame, caused by the displacement, requires special attention and is relatively complicated and time-consuming because, if the longitudinal displacement of the fixing screws, and with it the tilting of the pair of levers, is not completely even with this arrangement, then the single embroidery frame to be clamped arrives each time in a different position with respect to the central axis

between the two pairs of levers; consequently, the location of the starting stitch and with it the positioning of the embroidery pattern on the embroidery workpiece changes continuously which, in most cases, is not acceptable as it either affects the quality of the product or it requires a time-consuming correction of the clamping of the workpiece to be embroidered or of the embroidery frame. As furthermore the holding force, with which each embroidery frame is clamped, is dependent on the more or less severe abutment of the clamping means onto the embroidery frame due to tilting of the pairs of levers including the clamping means occurring during the displacement of the fixing screws, thus being extremely variable from embroidery frame to embroidery frame, the reliability and accuracy of clamping is highly dependent on the thoroughness of the operating person.

An object of the invention is to provide an embroidery machine with a clamping device in such a manner that each embroidery frame is clamped with a consistent holding force and is disposed in the desired position for starting the embroidery.

According to the invention the position of the embroidery frame in the Y-direction may be precisely determined by abutment surfaces, disposed at an angle with respect of each other on a support which is

connectable with the frame guide, and the position of the embroidery fame in the X- direction may be precisely determined by the protrusion which enters into the recess of a spring member; consequently, the embroidery process can always commence at the same location. The use of a spring member ensures that the holding force is not subjected to fluctuations as it is not dependent on the accuracy of the operating person during the clamping procedure.

In an embroidery machine with a clamping device according to the invention, comprising a transversely slotted outer frame with at least two oppositely disposed support surfaces for matching abutment surfaces of oppositely disposed supports, and with its separated ends linked by means of a clamping lock, the clamping lock is normally (for example DE-GM 1 980 503) arranged in one location offset at an angle with respect to the symmetrical axis of the oppositely disposed abutment surfaces. When clamping embroidery workpieces of different thickness, the transversely slotted outer frame is expanded at varying degrees. Thus, the support surfaces, intended to abut against the abutment surfaces of the holders, are angularly displaced with respect to the abutment surfaces of the supports. Consequently, when inserted into the supports, the two-piece single embroidery frame adopts each time a different angular

position with respect to the symmetrical axis of the abutment surfaces, depending on the thickness of the embroidery workpiece, whereby the position of the motif to be embroidered or the embroidery pattern in the embroidery workpiece respectively deviates from the desired position; however, sofar correction has been possible only by way of renewed alignment-correcting clamping or reclamping of the embroidery workpiece, causing considerable waste in time and in most cases several repeat procedures as the correction figure cannot easily be estimated during the clamping process.

It is therefore, of particular importance to arrange the tension lock in order to to be able to achieve, independent of the thickness of the embroidery workpiece, an angularly symmetrical expansion of the transversely slotted outer frame with respect to the symmetrical axis of the abutment surfaces during clamping, thereby safely fitting the single embroidery frame into the supports in the correct position for the embroidery pattern to be produced.

Preferably the holder which is opposite the abutment surface on the spring member has two abutment surfaces including an angle, for support surfaces on the outer frame, and that the spring member is formed to include a recess for a protrusion on the outer frame, positioned on the bisector of the angle formed by the

abutment surfaces.

Preferably the spring member has a slanting contact surface with a detent shoulder adjacent thereto for the protrusion of the outer frame, whereby the fitting of a single embroidery frame into the clamping device can be done practically "blind".

Another possibility for easier fitting and secure fixing of an embroidery frame may be provided by forming the recess by a hollow wedge-shaped sink bore, and the protrusion being a hemispherical protrusion.

The positioning height of the single embroidery frames in the clamping device may be precisely set by the abutment surfaces of the one support and the free ends of the support brackets having complementary locating formations.

In one preferred embodiment the abutment surfaces of the one support are formed on raised ribs and the free ends of the support brackets on the outer frame match the ribs.

In another preferred embodiment the abutment surfaces of the one support are concave, and the free ends of the support brackets on the outer frame match the abutment surfaces.

Advantageously the spring member is made in one piece with the support.

Overstretching of the spring member may be

avoided by having a limiting stop on the support for the spring movement of the spring member.

In order to allow to keep the intermediate frame fixed onto the frame guide for fitting of a single embroidery frame of different shape or size, and to adjust only the one support at the intermediate frame the supports are preferably arranged on lateral members of an intermediate frame which is to be connectable with the drive of the embroidery machine wherein preferably also the one support is displaceable in the Y-direction and lockable with the intermediate frame.

Advantageously, two oppositely disposed leaf springs, made in one piece with the support and including a latch pin for bores of the intermediate frame, serve as a locking device.

By having spring means in the slot of the outer frame by which it is spread open, the symmetrical axis of the abutment surfaces of the outer frame remains unchanged, independent of the thickness of the embroidery workpiece, so that displacements in the positioning of the embroidery workpiece can be avoided.

The invention will now be further described, by way of example only, with reference to the accompanying drawings, in which:-

Figure 1 is a top view of a clamping device, including two single embroidery frames, with differently

constructed fixing means, mounted onto the support frame of an embroidery machine;

Figure 2 is a cross-section along the line II-II of Figure 1, at enlarged scale;

Figure 3 is a cross-section along the line III-III of Figure 1, also at enlarged scale;

Figure 4 shows a single embroidery frame with a tension lock arranged in the symmetrical axis of the abutment surfaces of the outer frame, and part of a support with a different form of embodiment of the locking device;

Figure 5 is a cross-section along the line V-V of Figure 4 at enlarged scale;

Figure 6 is a cross-section along the line VI-VI of Figure 4, at enlarged scale; and

Figure 7 shows a clamping lock for the outer frame with spring means in its transverse slot.

Referring to the accompanying drawings, identified by 1 are longitudinal frame elements of the frame guide of an embroidery machine, which guide is displaceable, for example by step motors, in two directions perpendicular to each other (X-direction and Y-direction) with respect to the embroidery heads. Several support frames, for example 2 and 3, provided to accommodate single embroidery frames of different shapes and sizes, can be screwed onto the longitudinal

frame elements 1. The support frames 2 and 3 consist of two lateral members 4 and 5 which, with reference to Figure 1, are connected at the top side by each one cross member 6 with a fixing plate 7. At the bottom side, the lateral members 4 and 5 of the support frame 2 are coupled by a support 8 including a fixing plate 7, and the lateral members 4, 5 of the support frame 3 are also coupled by a support 9 including a fixing plate 7. The support frames 2 and 3 are screwed onto the longitudinal frame elements 1 by means of the fixing plates 7.

For secure fixing of a single embroidery frame 10, consisting of a closed inner frame 11 and a transversely slotted outer frame 13 which is coupled by means of a tension lock 12, a support, adjustably arranged on the lateral members 4, 5 of the support frame 2, and a bending spring 15, integrated into the support 8, are provided.

In a thickening 16 of the bending spring 15, there is a hollow-conical sink bore 17 for a hemispherical protrusion 18 on the outer frame 13. The protrusion 18 and the sink bore 17, into which the protrusion is inserted, constitute the one point of the three-point clamping of the single embroidery frame 10. The other two points are located on two ribs 19, 20 of trapezoidal cross-section with abutment surfaces 21, 22

on the support 14. In the example of embodiment, the support and abutment surfaces 19 to 22 include a right angle. The sink bore 17 for the protrusion 18 is located on the bisector of this angle.

On the outer frame 13, two support brackets 23, 24 are provided, the free ends of which fit the ribs 19, 20 and the abutment surfaces 21, 22. A stop 26 is provided on the support 8 to limit the spring movement of the bending spring 15 during fitting and removal of the single embroidery frame 10.

The support 14 is tensionally adjustable in several positions towards the lateral members 4, 5 of the support frame 2 due to the detent bolts 29, 30 which are under the influence of pressure springs 27, 28, thus allowing single embroidery frames of different shapes and sizes to be clamped in.

The support frame 3 serves to accommodate another embroidery frame 31, consisting of a closed inner frame 32 and a transversely slotted outer frame 33 including a tension lock 34. Into the support 9 is integrated a bending spring 35 which has a thickening 36 with a protrusion 37, Figure 2, with a slanting contact surface 38 and a thereto adjacent detent shoulder 39.

An extension 40 on the outer frame 33 co-acts with the protrusion 37 including the contact surface 38 and the detent shoulder 39. Into the free end of the

extension 40 is incorporated a V-shaped groove 41 with a rounded slide surface 42 for the slanting contact surface 38 of the extension 40 and a surface 43 to fit the slant of the contact surface 38 of the extension 40.

The protrusion 37 and the groove 41 constitute the one point of the three-point clamping of the single embroidery frame 31. The other two points are located on two ribs 44, 45 of semi-circular cross-section and abutment surfaces 46, 47 of a support 48. The ribs 44, 45 and the abutment surfaces 46, 47 include a right angle. The extension 40 for the protrusion 37 of the bending spring 35 is located on the bisector of this angle.

On the outer frame 33, two support brackets 49, 50 are provided, the free ends of which match the shape of the ribs 44, 45 and the abutment surfaces 46, 47.

A stop 51 is provided on the support 9 in order to limit the spring movement of the bending spring 35 during fitting and removal of the individual embroidery frame 31. The support 48 can also be clamped against the lateral members 4, 5 in different positions by means of the detent bolts 29, 30 which are under the influence of the pressure springs 27, 28, thus allowing the clamping of single embroidery frames of different shapes and sizes.

In Figures 4 to 7 is shown a single embroidery

frame 55, consisting of a closed inner frame 52 and an outer frame 54, divided by a transverse slot 53, with a support 56 and a bending spring 57, integrated like the bending spring 15 or 35 into the support 8 or 9 respectively, as well as a tension lock 58 and a production-technically advantageous form of embodiment of a locking device 59 for the support 56.

Three support brackets 60, 61, 62 are provided on the outer frame 54. The free ends of the support brackets 60 61 are rounded and constitute support surfaces 63, 64 for matching concave abutment surfaces 65, 66, Figure 6, on the support 56 which is otherwise similar in construction to the supports 14 or 48. The abutment surfaces 65, 66 include an angle. The support bracket 62 is located on the bisector of this angle. The free end of the support bracket 62 is wedgeshaped, Figure 5. The wedge surfaces 67, 68 constitute support surfaces for matching abutment surfaces 69, 70 on a thickening 71 of the bending spring 57. The stop 26 or 51 respectively on support 8 or 9 respectively as shown in Figure 1 serves to restrict the spring movement of the bending spring 57.

The tension lock 58, arranged in the symmetrical axis of the support surfaces 63, 64 and the abutment surfaces 65, 66, 69, 70 consists of a cylindrical nut 72 including a transversely orientated threaded bore, which

nut is rotatably inserted into a bore in the outer frame near the transverse slot 53, a cylindrical support bearing 73 with a transversely orientated stepped bore, which bearing is rotatably inserted in the outer frame 54 into a bore on the other side of the transverse slot 53, as well as a tensioning bolt 74 which is a collar bolt, guided through a bore which extends through the slotted ends of the outer frame 54 and the stepped bore in the support bearing 73 and screwed into the nut 72, as well as two cup springs 75 arranged on the tensioning bolt 74 in the transverse slot 53. The transversely slotted outer frame 54 is resiliently pretensioned in a spreading direction by the cup springs 75.

Instead of the two support brackets 60, 61, provision can also be made for only one support bracket, positioned opposite the support bracket 62, with one support surface for an abutment surface provided on the support 56.

Each of the locking devices 59, arranged at each other opposing sides of the support 56, Figure 7, consists of a leaf spring 76, constructed in one piece with the support 56 and including a latch pin 78, engaging a longitudinal slot 77 in the holder 56, which engages one of several bores 79 in the lateral members 4, 5 of the support frame 2 or 3 respectively in order to lock the support 56 in several positions with the

support frame 2 or 3 respectively. Thus, single embroidery frames of different shapes and sizes can be fitted into the support frame 2 or 3 respectively.

During a current embroidery process, the workpiece is placed outside the embroidery machine, with the tension lock 12 or 34 respectively open, on the outer frame 13 or 33 respectively, with the inside frame 11 or 32 respectively pushed into the outer frame 13 or 33 respectively and clamped between the inside and the outside frame by means of the tension lock 12 or 34 respectively.

To remove the single embroidery frames 10 and 31 at the end of an embroidery process, they are pulled against the bending spring 15 or 35 respectively so that the bending spring 15 or 35 respectively bends through and abuts against the stop 26 or 51 respectively. Thereby, the support brackets 23, 24 are released from the ribs 19, 20, and the abutment surfaces 21, 22 or the support brackets 49, 50 respectively are released from the ribs 44, 45 and the abutment surfaces 46, 47. The single embroidery frames 10 and 31 can then be slightly tipped upwards at their rear and removed from the support frame 2 or 3 respectively.

The fitting of the embroidery frame 10 with a previously clamped in embroidery workpiece is done in that the support brackets 23, 24 are abutted against the

ribs 19, 20 and the abutment surfaces 21, 22 of the support 14. At this stage, the protrusion 18 still rests on the tension free bending spring 15 so that the single embroidery frame 10 can be aligned. By light pressure onto the embroidery frame 10 in the area of the protrusion 18, the bending spring 15 is bent over the protrusion 18 towards the stop 26, and the protrusion 18 engages in the sink bore 17.

In the same manner, the free ends of the support brackets 49, 50 of the embroidery frame 3 with a previously clamped in workpiece are abutted against the ribs 44, 45 and the abutment surfaces 46, 47 of the support 48. The extension 40 of the outer frame 33 will then still rest on the untensioned bending spring 35 so that the single embroidery frame 31 can be aligned. By exerting light pressure in the area of the extension 40, the bending spring 35 is bent towards the stop 51 via the slide surface 42 which co-acts with the transverse contact surface 38, and the protrusion 37 engages into the groove 41.

Both the height position of the embroidery frame 10 or 31 respectively and the position relative to the frame guide of the embroidery machine is precisely and repeatably determined by the ribs 19, 20 or 44, 45 respectively and the abutment surfaces 21, 22 or 46, 47 respectively in conjunction with the thereto matched

free ends of the support brackets 23, 24 or 49, 50 respectively and the protrusion 18 in conjunction with the sink bore 17 or the protrusion 37 respectively in conjunction with the groove 41.

The particularity of the operational method of the single embroidery frame 55 lies in that the outer frame 54, when opening the tension lock 58 for matching with the thickness of the embroidery workpiece by means of the cup springs 75 due to the arrangement of the transverse slot 53 in the symmetric axis of the support surfaces 63/64, 67/68 and abutment surfaces 65/66, 69/70, is symmetrically spread open so that the angular position of the support brackets 60, 61 is maintained independent of the thickness of the embroidery workpiece. Consequently, the single embroidery frame 55 is always fitted in the same angular position into the supports 56 and 8 or 9 respectively. Thus, corrections by way of reclamping of the embroidery workpiece are completely avoided.

With the single embroidery frame 55, as with the single embroidery frames 10 and 31, the embroidery workpiece is positioned during a current embroidery process outside the embroidery machine on the outer frame 54, with the tension lock 58 open, with respect to the pattern to be embroidered, with the inside frame 52 pressed into the outside frame 5 and clamped by means of

the tension lock 58 between inside and outside frame.

The fitting into the supports 56 and 8 or 9 respectively and the removal of the single embroidery frame 55 is done in the same way as described above in the example of handling the single embroidery frames 10 and 31.

CLAIMS

1. An embroidery machine with a clamping device for single embroidery frames which are to be separably coupled with the clamping device and which comprise an inner frame and a surrounding outer frame with the embroidery workpiece inbetween, wherein the clamping device has, for the purpose of three-point clamping of the embroidery frame, two oppositely disposed supports, one of which has two abutment surfaces including an angle for matched support surfaces of the outer frame, and the other has a spring member with a recess for a protrusion on the outer frame, positioned on the bisector of the angle formed by the abutment surfaces.

2. An embroidery machine with a clamping device for single embroidery frames which are to be separably coupled with the clamping device and which comprise an inner frame and a surrounding transversely slotted outer frame with the embroidery workpiece inbetween, which outer frame consists of at least two oppositely disposed support surfaces for matched abutment surfaces of oppositely disposed supports and the ends of which are coupled by means of a tension lock, wherein the abutment surface of the one support is arranged on a spring member, and that the tension lock is arranged in the symmetrical axis of this abutment surface and the

abutment surface(s) of the other support.

3. An embroidery machine as claimed in claim 2, wherein the holder which is opposite the abutment surface on the spring member has two abutment surfaces, including an angle, for support surfaces on the outer frame, and that the spring member is formed to include a recess for a protrusion on the outer frame, positioned on the bisector of the angle formed by the abutment surfaces.

4. An embroidery machine as claimed in claim 1, 2 or 3, wherein the spring member has a slanting contact surface with a detent shoulder adjacent thereto for the protrusion of the outer frame.

5. An embroidery machine as claimed in claim 1, 2 or 3, wherein the recess is formed by a hollow wedge-shaped sink bore, and the protrusion is a hemispherical protrusion.

6. An embroidery machine as claimed in claim 1, 2 or 3, wherein the abutment surfaces of the one support and the free ends of the support brackets have complementary locating formations.

7. An embroidery machine as claimed in claim 6, wherein the abutment surfaces of the one support are formed on raised ribs, and the free ends of the support brackets on the outer frame match the ribs.

8. An embroidery machine as claimed in claim 6,

wherein the abutment surfaces of the one support are concave, and the free ends of the support brackets on the outer frame match the abutment surfaces.

9. An embroidery machine as claimed in claim 1, 2 or 3, wherein the spring member is made in one piece with the one support.

10. An embroidery machine as claimed in any one of claims 1 to 5 and 9, having a limiting stop on the support for the spring movement of the spring member.

11. An embroidery machine as claimed in any one of claims 1 to 10, wherein the supports are arranged on lateral members of an intermediate frame which is to be connectable with the drive of the embroidery machine.

12. An embroidery machine as claimed in claim 11, wherein the one support is displaceable in the Y-direction and lockable with the intermediate frame.

13. An embroidery machine as claimed in claim 12, wherein two oppositely disposed leaf springs, made in one piece with the support and including a latch pin for bores of the intermediate frame, serve as a locking device.

14. An embroidery machine as claimed in claim 2 or 3 with claim 10, having spring means in the slot of the outer frame by which means it is spread open.

15. An embroidery machine substantially as hereinbefore described with reference to and as

illustrated in Figures 1 to 3 or Figures 4 to 7 of the accompanying drawings.

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